

**ANNEX  
BETWEEN  
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
AMES RESEARCH CENTER  
AND  
LAWRENCE LIVERMORE NATIONAL SECURITY, LLC  
UNDER SPACE ACT UMBRELLA AGREEMENT  
NO. 32993 / SAA2-403582  
(ANNEX NUMBER TWO)**

**ARTICLE 1. PURPOSE**

This Annex shall be for the purpose of conducting discovery/validation type experiments using the Ames Vertical Gun Range (AVGR) at NASA ARC for the prediction of aerodynamic loads and heating and to evaluate the impact of shock-shock and shock-structure interaction on the aerodynamic performance of a flight vehicle. NASA will operate the AVGR facility and laser diagnostic system(s) to provide the test conditions of interest to the Partner for their research. NASA will provide test planning support and operational test data from the AVGR experiments to the Partner. The Partner will work with the ARC team to provide the test requirements and specialized equipment as needed for the experiments. The Partner benefits from using ARC's unique facility to get critical testing support for research and development activities in hypervelocity aerodynamics, impact physics, flow-field structure and chemistry.

The legal authority for this Annex, consistent with the Umbrella Agreement, is in accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113(e)).

**ARTICLE 2. RESPONSIBILITIES**

A. NASA ARC will use reasonable efforts to:

1. Operate the AVGR within the Thermophysics Facilities Branch (TSF) to provide the test conditions needed by the LLNL test team in order to conduct their research
2. Configure the facility as needed, deliver operational test data (i.e. video recordings, impact chamber environmental conditions, projectile parameters-speed, mass, etc.), and provide guidance and assistance with test planning
3. Configure and operate the laser diagnostic system(s), deliver data obtained with this equipment, and provide guidance and assistance with test planning

B. Partner will use reasonable efforts to:

1. Provide oversight, direction and collaborative participation, as needed, to enable validation/discovery type experiments to be conducted using the AVGR within the TSF facilities at NASA ARC.
2. Collaborate with the ARC investigative team to fully define the test requirements

3. Provide any specialized equipment and instrumentation that does not already exist within the TSF facilities
4. Participate in the test campaigns and conduct all of the post test data analysis.

### ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

Milestones	Estimated Completion Date
Eight (8) days of AVGR testing	No later than 9/30/2022

### ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA an estimated cost of \$184,940 for NASA to carry out its responsibilities under this Annex. Each payment shall be marked with Ames, Annex Two, SAA2-403582-2.

B. NASA will not provide services or incur costs beyond the current funding. Although NASA has made a good faith effort to accurately estimate its costs, it is understood that NASA provides no assurance that the proposed effort under this Annex will be accomplished for the estimated amount. Should the effort cost more than the estimate, Partner will be advised by NASA as soon as possible. Partner shall pay all costs incurred and have the option of canceling the remaining effort, or providing additional funding in order to continue the proposed effort under the revised estimate. Should this Annex be terminated, or the effort completed at a cost less than the agreed-to estimated cost, NASA shall account for any unspent funds within one year after completion of all effort under this Annex, and promptly thereafter, at Partner's option return any unspent funds to Partner or apply any such unspent funds to other activities under the Umbrella Agreement. Return of unspent funds will be processed via Electronic Funds Transfer (EFT) in accordance with 31 C.F.R. Part 208 and, upon request by NASA, Partner agrees to complete the Automated Clearing House (ACH) Vendor/Miscellaneous Payment Enrollment Form (SF 3881).

### ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of one year.

B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party. The lists below may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data provided.

1. Background Data:  
The Disclosing Party's Background Data, if any, will be identified in a separate document.
2. Third Party Proprietary Data:  
The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate document.
3. Controlled Government Data:  
The Disclosing Party's Controlled Government Data, if any, will be identified in a separate document.
4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement:  
None

#### ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or one year from the Effective Date, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

#### ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

#### ARTICLE 8. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Annex.

##### Management Points of Contact

##### NASA Ames Research Center

Nahri Ahn  
Agreements Manager  
Moffett Field, CA 94035  
Phone: 650-604-1179  
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##### Lawrence Livermore National Security, LLC

Bill Bruner  
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Livermore, CA 94550  
Phone: 925-422-0552  
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##### Technical Points of Contact

##### NASA Ames Research Center

Charles Cornelison  
Researcher  
Moffett Field, CA 94035

##### Lawrence Livermore National Security, LLC

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7000 East Ave, L-556  
Livermore, CA 94550

Phone: 650-604-3443  
charles.j.cornelison@nasa.gov

Phone: 925-424-4635  
salari1@llnl.gov

#### ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

#### ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

**NATIONAL AERONAUTICS AND  
SPACE ADMINISTRATION  
AMES RESEARCH CENTER**

**LAWRENCE LIVERMORE  
NATIONAL SECURITY, LLC**

BY: \_\_\_\_\_  
Rupak Biswas  
Director of Exploration Technology

BY: \_\_\_\_\_  
Karen Pliszka  
Contract Analyst

DATE: \_\_\_\_\_

DATE: \_\_\_\_\_